



COMDTINST 16478.10

MAY 25 1994

COMMANDANT INSTRUCTION 16478.10

Subj: AIDS TO NAVIGATION (ATON) BATTERY RELEASE REPORTING
REQUIREMENTS

Ref: (a) Comprehensive Environmental Response, Compensation, and Liability Act
(CERCLA), (P.L. 96-510)
(b) Hazardous Waste Management Manual, COMDTINST M16478.1B

1. PURPOSE. This instruction addresses the Coast Guard's responsibilities associated with reporting the discovery of ATON battery sites and sets policy for internal and external reporting. The users of this guidance are the District Commanders, and all those involved with the handling of ATON batteries within the Coast Guard. The guidance is limited to the procedures for reporting the release of ATON batteries containing hazardous substances into the environment. Separate guidance addressing the recovery of such batteries is forthcoming.
2. ACTION. District Commanders shall disseminate this instruction to all personnel who are involved with the use, handling, and disposal of ATON batteries, and ensure that they comply with its requirements.
3. DISCUSSION.
 - a. Non-permitted disposal of hazardous substances, including ATON batteries, by dumping, abandoning, burying, etc. is prohibited by Federal environmental laws and regulations. ATON batteries are considered hazardous waste, and in certain numbers may constitute reportable quantities of mercury, lead or electrolyte fluids to be reported under Section 103(a) of reference (a) and applicable state or local laws.

- b. The Coast Guard is committed to taking all appropriate actions to protect the environment and report the release of hazardous substances in accordance with federal, state, and local laws and regulations. District Commanders are responsible for identifying all sites where ATON batteries are, or have been, released and for notifying the appropriate federal, state, and local environmental regulatory agencies of each release in excess of a reportable quantity (RQ) under reference (a) and applicable state or local laws.
- c. Section 101(22) of reference (a) broadly defines a "release" to include the abandonment of "containers, and other closed receptacles containing hazardous substances...". The disposal, dumping or accidental knockdown of ATON batteries on land or water qualifies as a release and may require, under Section 103(a) of reference (a), reporting to the National Response Center (NRC). The duty to report depends upon the types and numbers of batteries released which, in total, may contain an RQ of hazardous substances. The condition of the batteries (broken or intact) has no bearing on the determination of RQ. Section 103(b) of reference (a) provides for criminal penalties for failure to report the release of an RQ of hazardous substances.

4. PROCEDURES.

- a. Effective immediately, Coast Guard units which know of, or learn of, the existence of discarded or lost ATON batteries through a knockdown incident or through past disposal shall notify the cognizant District Commander by message. The message must include:
 - (1) date of discovery;
 - (2) the site name, Light List Number (LLNR), and location (including latitude and longitude, if known);
 - (3) approximate number and types of batteries, if known;
 - (4) the source of information (including person's name, telephone number, and address if a private citizen reports the presence of such batteries to the Coast Guard);
 - (5) any other relevant information about the site (such as navigation chart number or USGS quadrangle map name) and the circumstances related to its discovery.

- b. Aids to Navigation Team (ANT) and Buoy Tender personnel shall look for batteries in the vicinity of ATON structures and buoys during their routine operational duties and shall report any findings as required by paragraph 4.a.
- c. District Commanders shall determine whether a release of batteries involves an RQ under Section 103(a) of reference (a) using the guidance "ATON BATTERIES: REPORTABLE QUANTITIES UNDER CERCLA 103(a)", enclosure (1) to this instruction.
- d. If the release is an RQ, under reference (a) or state or local laws, District Commanders must report it to the NRC (Telephone 800-424-8802) and the appropriate state or local regulatory agency **immediately**. Section 9.B.5 of reference (b) provides details on the information to be included in such reports. Additional information on the requirement to notify state and local agencies can be obtained from the servicing Civil Engineering Unit (CEU). **This reporting requirement is retroactive to 30 Jun 93** (the date when the RQ for lead sulfate was decreased from 100 to 10 lb). District Commanders shall determine whether past RQ determinations complied with the quantities outlined in enclosure (1). If not, release notification must be made concerning those past releases.
- e. District Commanders must maintain records of all communications concerning each incident of battery release.
- f. District Commanders shall forward a copy of the message referred to in paragraph 4.a, above to their servicing CEU. Information copies shall also be sent to the shore divisions of the servicing Maintenance and Logistics Command (MLC(s)) and to Commandant (G-ECV-1). Information on sites with an RQ, along with the information required in paragraph 4.a, shall include the names of all regulatory agencies notified.
- g. District Commanders are responsible for responding to all Federal, state, or local regulatory inquiries related to battery releases. Technical questions shall be forwarded to the cognizant CEU. All media inquiries should be coordinated through the District Public Affairs Staff.

- h. Points of contact for battery reporting issues are MLCLANT(sp), (212) 668-7047; MLCPAC(se), (510) 437-3916; (G-ECV-1), (202) 267-1968; (G-LEL), (202) 267-0056; and (G-NSR), (202) 267-0350.

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Encl: (1) ATON Batteries: reportable quantities under CERCLA 103(a).

**ATON BATTERIES: REPORTABLE QUANTITIES
UNDER CERCLA 103(a)**

**A Guide to Determine Reportable Quantities
(Revised March 1994)**

Prepared by

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ATON BATTERIES: REPORTABLE QUANTITIES UNDER CERCLA 103(a)

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ATON BATTERIES: REPORTABLE QUANTITIES UNDER CERCLA 103(a)

1. OBJECTIVE

This report provides guidance for calculating reportable quantities (RQ) of a release of Aids to Navigation (ATON) batteries, which must be reported to the National Response Center (NRC) under Section 103(a) of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA). Discarded ATON batteries are considered to be hazardous waste, and in certain numbers constitute RQ to be reported to the NRC and other appropriate Federal, State and local environmental regulatory agencies. This report also provides information on battery constituents, and the types of batteries that were historically used to provide power on ATON structures. The information presented is the best available at the time of completion of this report. Other batteries may be discovered that have not been evaluated in this report. When discoveries of this kind are made, the information should be passed to Commandant (G-ECV-1A).

2. THE POLICY ON ATON BATTERY RELEASE REPORTING

Effective immediately, Coast Guard units, upon discovering a release of ATON batteries in any quantity, by Coast Guard personnel or outside sources, must notify their cognizant District Commander by message. District Commanders should determine whether or not the release is an RQ. If the release is an RQ, District Commanders must report the release to NRC under CERCLA Section 103(a), and to appropriate State and local environmental regulatory agencies. District Commanders should inform the cognizant CEU of the reported releases, and request an Environmental Compliance & Restoration (EC&R) project for site remediation, where necessary. District Commanders must keep all the records regarding discovering and reporting of the battery

releases. If any doubt exists about whether a release is reportable or not, District Commanders must contact MLC(1) and/or the regulatory agency for further advice.

3. DESCRIPTION OF ATON BATTERIES

A. PRIMARY BATTERIES

Primary batteries are those that cannot be recharged. Primary batteries were used on ATONs as early as 1918. By the 1940s, secondary batteries were in use. Primary batteries were used on a large scale in the early 1960s. Efforts to replace primary batteries with solar power panels and backup secondary batteries began in the early 1980s.

The first primary batteries were manufactured by Thomas A. Edison Industries. These batteries contained a copper-oxide plate, zinc plate, and a caustic soda electrolyte. A small amount of mercury was used on the zinc plate to protect it from corrosion. It has been reported that the copper-oxide batteries were reclaimed by the manufacturer for the copper content. In 1953, Thomas A. Edison Industries introduced Carbonaire batteries, in which the copper-oxide plate was replaced by porous carbon. Because of this change, the primary batteries were no longer returned for reclamation, often resulting in on-site disposal. Union Carbide introduced EVEREADY Air Cell batteries, but use of these batteries was discontinued in the mid-sixties. Other major suppliers of primary batteries to the Coast Guard have been: Saft, Inc.; Nife Inc.; and Carbone Corporation.

Ice Buoy Dry Cell Battery. This specially designed EVEREADY brand primary battery is made from 240 Zinc Carbon 1.5V (F) dry cells, providing 12V, 320 Ampere-hour (Ah) capacity. Ice Buoy batteries are used on floating aids to replace lighted buoys during ice seasons. The battery is 9" in diameter, and 32" in height.

Discrepancy Buoy Dry Cell Battery. This battery is specially designed by EVEREADY, using 120 Zinc Carbon 1.5V (F) dry cells to give 12V and 160 Ah. It is used for temporary replacement on floating buoys. The battery is 19" in diameter and 11" in height.

Emergency Power Dry Cell Battery (BA-44). This is a sealed, steel case, 6V, 25 Ah to 30 Ah, 10"x3"x7" oval-shaped battery. Three cells are connected in series to supply 18V for emergency power to ATONs which cannot be immediately serviced. The most commonly used primary batteries on Coast Guard ATONs are listed in Table 1.

B. SECONDARY BATTERIES

Lead-Acid Batteries- Secondary batteries are those which can be recharged. These batteries provide power to emergency lights, sound signals on Category I, II, and III aids, 12V power on Category IV aids, and power on solar powered aids. In the late 1930s, the Coast Guard used some 500 Ah secondary batteries on ATONs. The current, most widely used secondary batteries are 12V Maintenance Free Delco S2000, GNB 12-5000, and 6V Exide 3-DD-3. Secondary lead-acid batteries consist of a lead dioxide positive plate, metallic lead negative plate, and aqueous sulfuric acid electrolyte. The positive and negative plates have a coating of lead oxide paste, which reacts with sulfuric acid. As the cell discharges, both electrodes are converted to lead-sulfate. Recharging reverses the process.

Nickel-Cadmium Batteries- These batteries have nickel hydroxide positive and cadmium negative electrodes in potassium hydroxide electrolyte. Nickel-Cadmium batteries (HED-100, ED-80, ED-240, and ED-400) are commonly used on Category I, II, and III Aids during periods of AC power loss.

TABLE. 1. CG CLASSIFICATION OF ATON BATTERIES

CG CLASS	MFG TYPE	# OF CELLS WITHIN EACH BATT.
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EDISON/NIFE/SAFT-NIFE PRIMARY BATTERIES*

2S10A	STA-2-1000	2
2S20A	STA-2-2000	2
3S30A	STA-3-3000	3
3S10A	STA-3-1000	3

SAFT AMERICA INC. PRIMARY BATTERIES*

1S10D	SPA-2-1200	2
3S10D	SPA-3-1200	3
2S20D	SPA-2-2400	2
3S30D	SPA-3-3600	3

CEGASA/AMCEL POWER PLUS OF AMERICA PRIMARY BATTERIES**

2S20D	AS10-4	2
3S30D	AS10-6	3
3S10D	3AS10-2	3
2S10D	2AS10-2	2

UNION CARBIDE EVEREADY PRIMARY BATTERIES

CG-212	Y2224	2
CG-124	Y2230	2

OTHER PRIMARY BATTERIES

ICE BUOY, DRY CELL	1***
DISCREPANCY, DRY CELL	1***
BA-44 EMERG POWER CELL	1***
2-ANS CARBONE	2

SECONDARY BATTERIES

12V DELCO (S2000)	1****
12V GNB (12-5000)	1****
6V EXIDE (3-DD-3)	1****

OTHER SECONDARY BATTERIES

HED-100 NIFE NICKEL-CADMIUM	1
ED-SERIES (80,240,400) NIFE NICKEL-CADMIUM	1
EI- SERIES (5,7,9,11,13,15,17) EXIDE LEAD-ACID	1
FHGS- SERIES (17,21,25) EXIDE LEAD-ACID	1
DH-5-1 Willard Storage LEAD-ACID	1
ABSOLYTE-II SERIES (75-85) GNB LEAD-ACID	1

* Edison/Nife and Saft have merged to Saft-Nife.

** AMCEL represents CEGASA batteries.

*** Consist of small cells, but sealed as one cell.

**** Consist of multiple cells in one case.

Other Lead-Acid Batteries. Other lead acid batteries used by the Coast Guard are EI Series (EI-5, 7, 9, 11, 13, 15, and 17) and FHGS Series (FHGS-17, 21, 25) manufactured by Exide; Absolyte-II, Series 75 and 85 manufactured by GNB; and DH-5-1 manufactured by Willard. These batteries are large in size and are used in limited numbers in lighthouses.

C. BATTERY CLASSIFICATION

Primary batteries are designated S or B, for their use at Shore (fixed) aids (S) or on Buoys (B). The next two digits of the classification represent the capacity of the battery in 100 ampere-hours. The last letter in the battery classification is A for liquid, or D for dry electrolyte. The number of cells in a battery is indicated by a digit in front of the first letter. A buoy power unit is a set of two and/or three battery cells connected in series, and/or parallel to obtain 12 or more volts, and capacities of 1000, 2000, 3000, 6000, etc. ampere-hours. Photographs and illustrations of various types of batteries are provided in Appendix A.

4.HAZARDOUS SUBSTANCES OF CONCERN IN ATON BATTERIES

The constituents of primary and secondary ATON batteries that are listed as hazardous substances in 40 CFR 302.4, and their reportable quantities (RQ), are given in Table 2.

TABLE 2. HAZARDOUS SUBSTANCES IN ATON BATTERIES

HAZARDOUS SUBSTANCE	TYPE OF BATT.	RQ*
MERCURY (Hg)	PRIMARY	1 POUND
POTASSIUM HYDROXIDE (KOH)	PRIMARY	1000 POUNDS
LEAD SULFATE (PbSO ₄)	SECONDARY	10 POUNDS
SULFURIC ACID (H ₂ SO ₄)	SECONDARY	1000 POUNDS
NICKEL HYDROXIDE-(Ni(OH) ₂)	SECONDARY	10 POUNDS
CADMIUM COMPOUNDS	SECONDARY	10 POUNDS

* These are Federal RQs. State RQs may differ.

5. REPORTABLE QUANTITIES OF ATON BATTERIES

The numbers of batteries constituting a reportable quantity has been calculated from the amounts of hazardous substances in the battery. Information on specific constituents of the batteries, provided by the manufacturers, is proprietary. This information is not included with this report, but is available from Commandant (G-ECV-1A).

A. PRIMARY BATTERIES

Mercury (Hg): Mercury in primary batteries is used for plating the zinc electrode to protect it from corrosion. Weight percent analysis of battery constituents from MSDS and proprietary information indicates: Edison and Carbone batteries contain 0.123%, Saft 0.29%, Cegasa 0.5%, and Eveready 0.12% mercury (References 1, 2, 3, and 4, see page 7). Using the weight percent of Hg, and the weight of the batteries, the reportable numbers of primary batteries producing a 1 lb reportable quantity of Hg, have been calculated in Table 3.

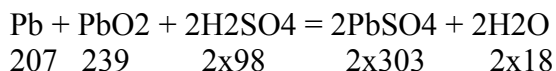
Potassium Hydroxide (KOH): Based on Material Safety Data Sheets (MSDS) and manufacturers' proprietary information, the weight percent of KOH in Saft, Edison, and Cegasa batteries is 9.5%, 10%, and 12.96%. Using the largest weight percent of a three cell Cegasa, the number of primary batteries producing a reportable quantity of KOH (1000 lbs) is over 160.

The Ice Buoy, Discrepancy, and Emergency dry cell Batteries listed in Table 1 are used on ship decks, and are not likely to be lost or discarded overboard. These batteries contain 0.025% mercury by weight. 57 Ice Buoy battery which consist of 240 small dry cells, will produce 1 lb RQ of mercury.

B. SECONDARY BATTERIES

Lead (Pb) and Lead Sulfate (PbSO₄): The lead used in secondary

batteries is larger than 100 microns (0.004 inch) in size and is exempted from Federal reporting requirements. However, the PbO₂ reacts with sulfuric acid and produces PbSO₄ (which is reportable) according to the following chemical equation.



Thus 6.67 lbs of H₂SO₄ will produce 20.6 lbs (303x6.67/98) of PbSO₄. The RQ for PbSO₄ is 10 lbs.

Delco S2000 Battery. Based on the battery MSDS (Reference 5) and proprietary information, this battery contains about 35 lbs of lead material, of which 23 lbs is PbO₂. The 60 lb battery contains about 18 lbs of 37% aqueous sulfuric acid (6.67 lbs pure H₂SO₄). Using the above equation, the quantity of PbSO₄ generated in a discharged battery is calculated as 20.6 lbs. Therefore, RQ for Delco S1200 battery is one (1) battery.

GNB 12-5000 Battery. The HSDS (Reference 6) states that the 40% aqueous H₂SO₄ electrolyte is 19.3%, by weight. In a 63 lb battery the amount of 40% H₂SO₄ is about 12 lbs. Using the above equation, the quantity of PbSO₄ generated in a discharged battery is calculated as 14.8 lbs. Therefore, RQ for GNB 12 500 battery is one (1) battery.

Exide 3-DD-3 Battery. This battery (weight = 40 lbs) contains 4.7 kilogram (10.5 lbs) of 39% solution of H₂SO₄ electrolyte (Reference 7). Using the discharge reaction equation, 12.6 lbs of PbSO₄ is calculated for a discharged battery. Therefore, RQ for Exide 3-DD-3 is one (1) battery.

Exide Series EI/FHGS and Willard DH-5-1. These batteries weigh more than Exide 3-DD-3 (smallest EI is over 60 lbs). Therefore, the RQ for this category is one (1) battery.

TABLE. 3. REPORTABLE QUANTITIES OF ATON BATTERIES**PRIMARY BATTERIES**

TYPE/CLASS	Wt.(LBS)	% Hg	Total Hg(LBS)	RQ (# BATT.)
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EDISON/NIFE/SAFT-NIFE PRIMARY BATTERIES

2 Cell 2S10A or 2S20A	30	0.123	0.037	27
3 Cell 3S10A or 3S30A	48	0.123	0.059	16

SAFT AMERICA INC. PRIMARY BATTERIES

2 Cell 2S10D or 2S20D	23	0.29	0.067	15
3 Cell 3S10D or 3S30D	34	0.29	0.099	10

CEGASA/AMCEL PRIMARY BATTERIES

2 Cell 2S10D or 2S20D	20	0.50	0.100	10
3 Cell 3S10D or 3S30D	30	0.50	0.150	7

OTHER PRIMARY BATTERIES

2 Cell EVEREADY	30	0.117	0.035	28
Dry Cell Ice Buoy	70	0.025	0.0175	57
2 Cell CARBONE	30	0.123	0.037	27

SECONDARY BATTERIES**LEAD-ACID BATTERIES:**

TYPE/CLASS	Wt.(LBS)	Wt of PbSO4	RQ (# BATT.)
12V DELCO S2000	60	20.60	1
12V GNB 12-5000	63	14.84	1
6V EXIDE 3-DD-3	40	12.60	1
2V WILLARD DH-5-1	58	18.27	1
ABSOLYTE-II 75 OR 85	270 (smallest)	N/A	1
EXIDE EI OR FHGS	62 (smallest)	N/A	1

Ni-Cad BATTERIES:

TYPE/CLASS	Wt.(LBS)	Wt of Ni(OH)2	RQ (# BATT.)
HED-100	21	2.10	5
ED-80	13	1.30	8
ED-240	30	3.03	4
ED-400	46	4.66	3

Absolyte-II Series 75 and 85. The smallest size of this classification of GNB batteries weighs over 270 lbs. Therefore, the RQ for these is one (1) battery.

Sulfuric Acid (H₂SO₄): References 4, 5, and 6 indicate that the Delco S2000 battery contains 18 lbs of H₂SO₄, GNB 12-5000 contains 12 lbs of H₂SO₄, and Exide 3-DD-3 contains 10.5 lbs of H₂SO₄. Since the reportable quantity of H₂SO₄ is 1000 lbs, the reportable number of Delco, GNB, and Exide batteries, when charged, is 55, 83, and 95. However, H₂SO₄ in a discharged battery is converted to water and PbSO₄.

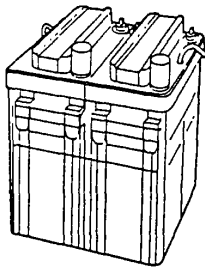
Nickel-Cadmium batteries. Nickel-Cadmium (Ni-Cad) batteries used by the Coast Guard (HED-100, ED-80, ED-240, ED-400) have nickel hydroxide (Ni(OH)₂), cadmium oxide (CdO₂), and KOH as reportable substances (reference 9). The RQs for Ni-Cad batteries are calculated based on the amount of Ni(OH)₂ (it is more prevalent in Ni-Cad batteries compared to the amounts of CdO₂ and KOH). Weights of Ni(OH)₂ and the RQs for Ni-Cad batteries are listed in Table 3.

6. REFERENCES:

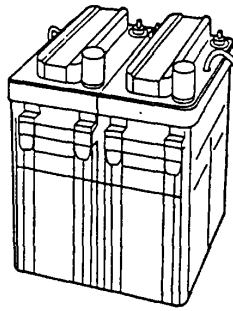
Some of the information in the references used in this report is proprietary. For this reason these references are not attached to this report, but are available at Commandant (G-ECV-IA).

1. MSDS, McGraw-Edison, with attachment of ST-2 and ST-3 material analysis by weight.
2. MSDS, Saft Batteries, with attachment of % weight analysis.
3. Certification of Chemical Composition & Materials Weight of Cegasa AS10-2 Primary Battery.

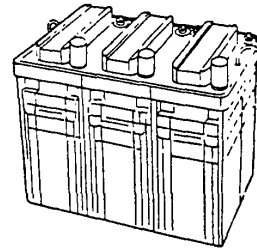
4. Background information on Eveready Batteries.
5. MSDS, Delco Remy Division, GMC.
6. MSDS, GNB Inc., 12-5000 Batteries.
7. Weights and Dimensions of 6-DB-600 and 3-DD-3 Exide Batteries.
8. COMDTINST M 16500.3A, Aids to Navigation Manual.
9. Materials and Weight information on Nickel-Cadmium batteries from SAFT/NIFE Inc.



(2S10A)

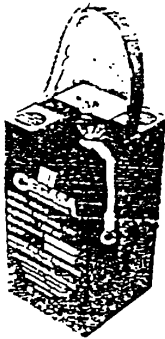


(2S20A)



(3S30A)

NIFE AIR DEPOLARIZED PRIMARY BATTERY



(S10D)

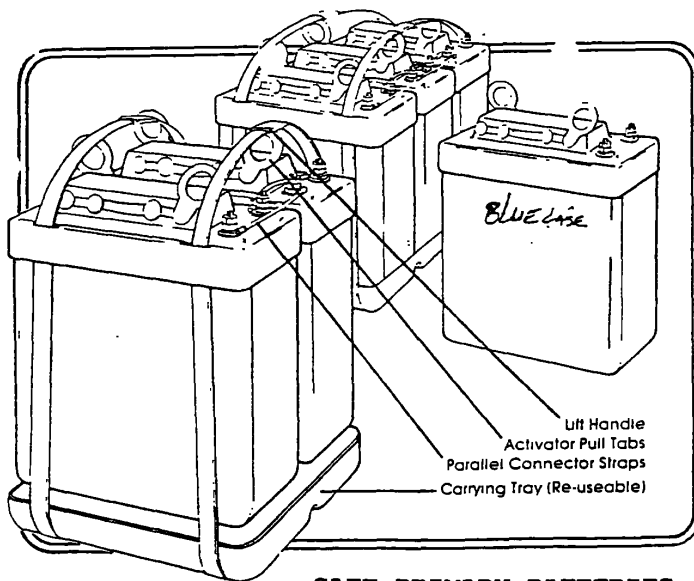


(2S20D)

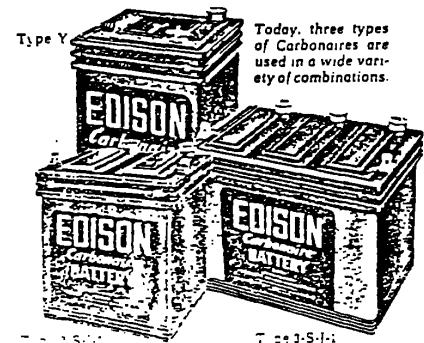


(3S30D)

AMCEL AIR-ALKALINE PRIMARY BATTERY

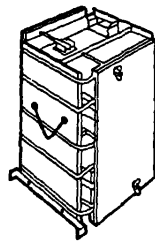


SAFT PRIMARY BATTERIES



EDISON PRIMARY BATTERIES

Batteries



(B10A)

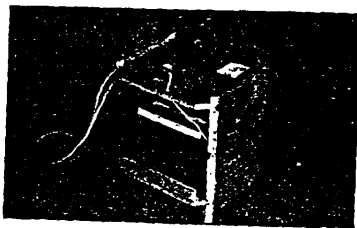


(B20A)



(B30A)

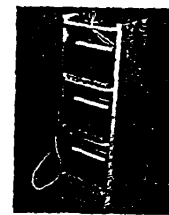
NIFE BUOY POWER UNIT



(B10D)

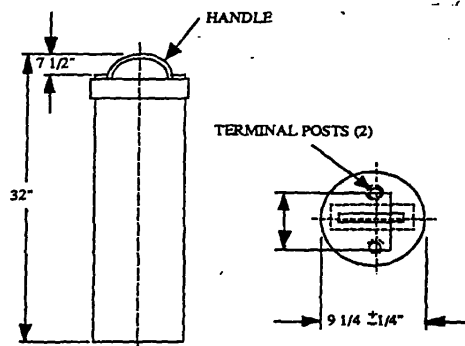


(B20D)

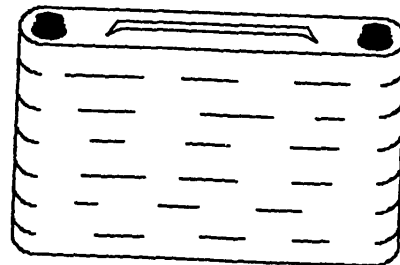


(B30D)

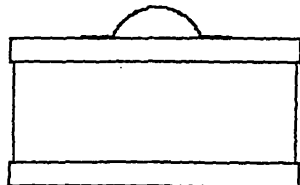
AMCEL BUOY POWER UNIT



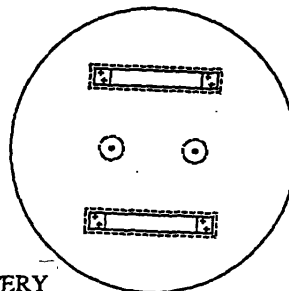
DRY CELL ICE BUOY PRIMARY BATTERY



EMERGENCY POWER DRY CELL BATTERY (BA-4)

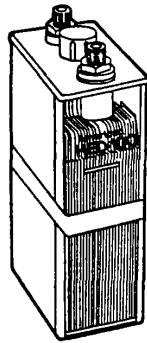


CELL DISCREPANCY BUOY PRIMARY BATTERY

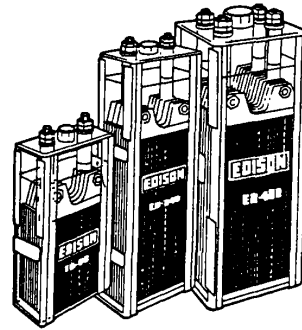




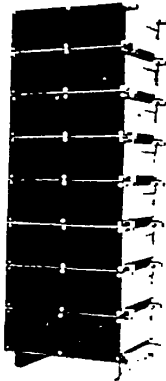
LEAD ACID BATTERY
(LARGE PHOTOVOLTAIC)



(HED-100)

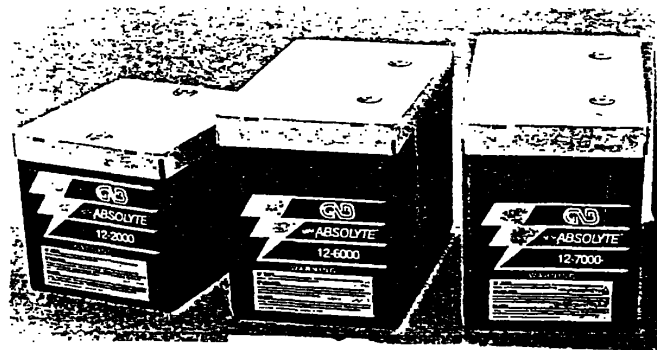


(ED-80, ED-240, AND ED-400)

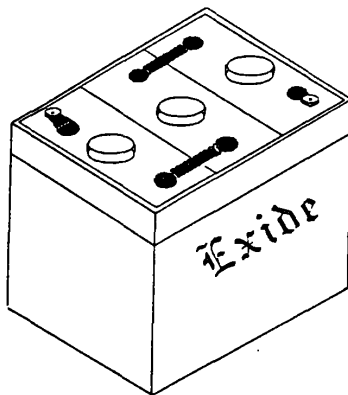


LEAD ACID BATTERY
(ABSORBED ELECTROLYTE)
(LARGE PHOTOVOLTAIC)

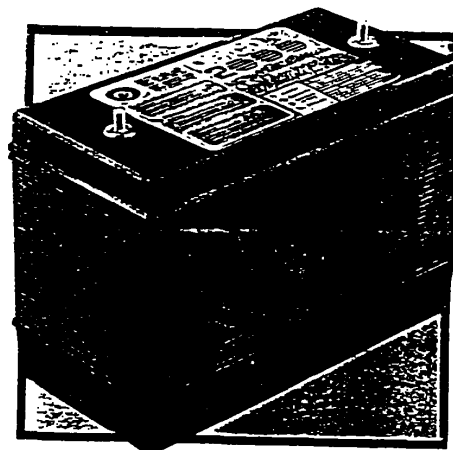
NICKEL-CADMIUM STORAGE BATTERY



12V Maintenance-free
Secondary Battery
(GNB 12-5000)



6V Secondary Batteries
(Exide 3-DD-3)



12V Maintenance-free
Secondary Battery
(Delco S2000)

Willard

Low Discharge

STORAGE BATTERIES



FOR USE WHERE THE CURRENT DEMAND
IS LOW • PRACTICALLY NO SELF-DIS-
CHARGE • CONSTANT VOLTAGE • DEPEND-
ABILITY • LONG LIFE • ECONOMY

Willards cost less to own



UCAR

"AIR CELL"

TRADE MARK

PRIMARY BATTERIES



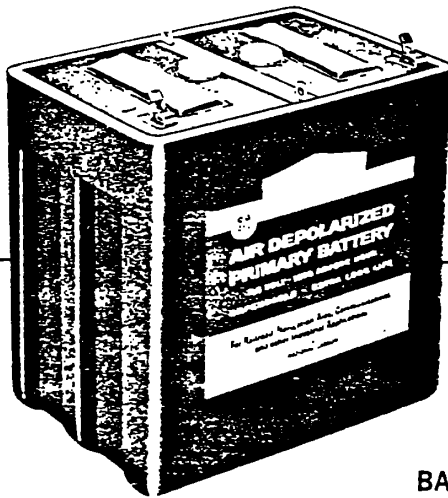
- Premium power sources
- Up to 3.75 amperes discharge capability
- Up to 65 per cent greater power density than any available air-depolarized battery

Dependable
MR Wenell

EVEREADY
AIR CELL

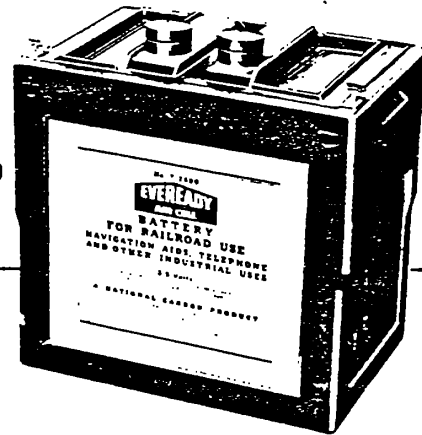
BATTERIES

for **AIDS-TO-NAVIGATION,
 RAILROAD AND OTHER USES**

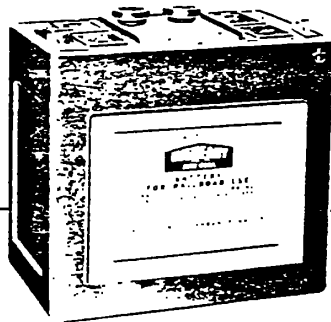


BATTERY TYPE CG-212
 Catalog No. Y 2224
 2.5V—1200 A.H.

Battery type CG-124, not illustrated, is the same as CG-212 except that it is a 1.25V, 2400 Ampere Hour battery with higher permissible drain.



BATTERY TYPE T-2600
 Catalog No. Y 2206
 2.5V—600 A.H.



BATTERY TYPE T-2300
 Catalog No. Y 2218
 2.5V—300 A.H.



BATTERY TYPE T-1600
 Catalog No. Y 2200
 1.25V—600 A.H.

Featuring

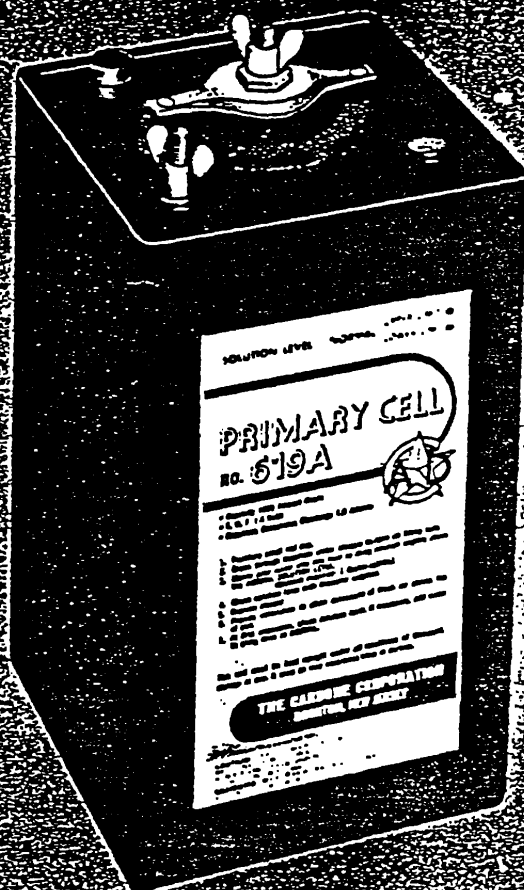
- LOW INSTALLATION—LOW MAINTENANCE COSTS
- LOW COST PER AMPERE HOUR
- UNIFORM VOLTAGE
- HIGHER DRAIN CHARACTERISTICS

Le Carbone

AD-619A

AIR-DEPOLARIZED PRIMARY CELL

For Aids to
Navigation,
Communications
and other
Heavy Duty
Applications.



OUTSTANDING FEATURES

- Small volume and weight for high capacity.
- Flat line voltage on discharge.
- Minimum labor required for handling, installation and maintenance.
- Safe operation at extremely low temperatures.
- Completely sealed and inert in storage.
- Small quantity of water required for activation.

THE CARBONE CORPORATION



BOONTON, NEW JERSEY

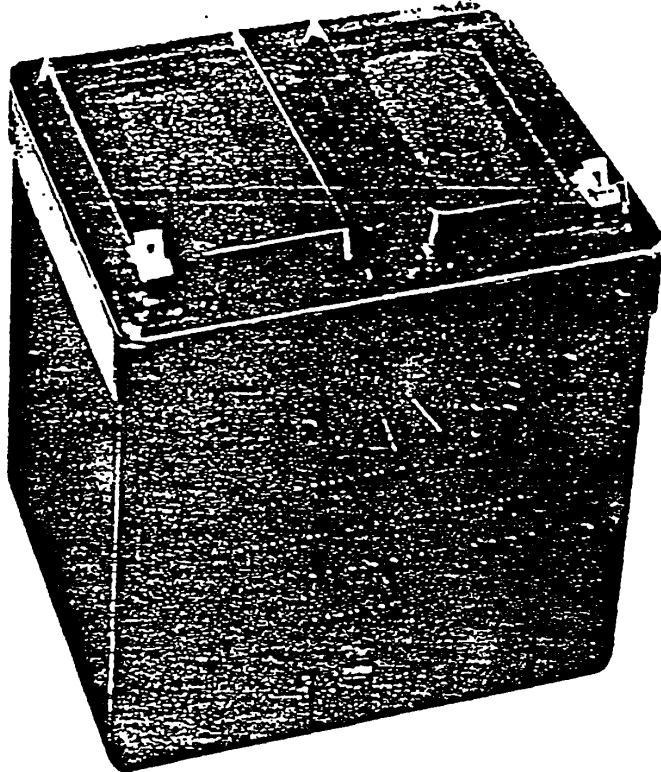
**AIR-DEPOLARIZED
WATER-ACTIVATED**

2-ANS PRIMARY BATTERY

FOR R.R. SWITCH LAMPS & AIDS TO NAVIGATION

ADVANTAGES

- *Flat line voltage on discharge*
- *Impossible to fill without venting*
- *1200 ampere-hour capacity*
- *Long shelf life without deterioration*
- *Requires little or no maintenance*



Clear plastic disposable cap is secured to top of battery to prevent entrance of moisture during shipment and storage, and to protect terminals. It is removed before the battery is put in service.

These air-depolarized primary batteries use atmospheric oxygen rather than chemical oxides to accomplish depolarization. Storage and service life is greatly increased because of air depolarization. They provide high capacity in a compact package with a minimum weight for intermittent-duty cycles such as for railroad switch lamps and aids to marine navigation.

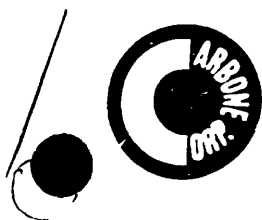
2-ANS batteries comprise two primary cells in series. Since they require a continuous supply of fresh air for satisfactory operation, 2-ANS batteries should not be operated in sealed enclosures. Most battery housings for switch-lamp and navigation-aid applications permit a sufficient exchange of air without modification.

2-ANS batteries are shipped with a protective cap that prevents moisture from entering during storage. Prior to use, this cap must be removed to obtain access to the filling holes and the terminal clips. This cap is not needed again and should be discarded.

PRIMARY
BATTERY



DIVISION



AN 110

Le Carbone
Air Depolarized
Dry Primary Battery

FEATURES

- High capacity
- Indefinite shelf life
- Clean
- Safe! No dangerous liquid electrolyte
- No solution mixing or water addition required
- Flat voltage curve on discharge
- No sudden drop in voltage as cell approaches exhaustion
- May be connected in series and/or in multiple
- Permanent construction
- Convenient size and weight
- Performance not affected by constant motion
- Economical! Extremely low cost per operating hour



The AN 110 is ready for service upon removal from the shipping container. Water buckets, funnels, solution height gauges mixing sticks and other equipment are not required when making a new installation or replacing exhausted cells.

The top of the cell contains air vents perforated at the factory with small holes. For most applications or for storage the vents need not be modified. If the cell capacity is to be exhausted in less than 9 months, the vents should be fully opened.

Any number of cells may be connected in series in multiple without danger of premature

battery failure, allowing the AN 110 to cover a wide field of requirements.

Having no dangerous liquid electrolyte and being of convenient size and weight, the AN 110 is particularly recommended for application where access to the installation site is difficult or hazardous. It is the ideal power source for lights on buoys, barges and pleasure craft.

The AN 110 is inspected both mechanically and electrically during manufacture and since there is no possibility of incomplete activation in the field, the user is assured the utmost dependability at all times.

THE CARBONE CORPORATION



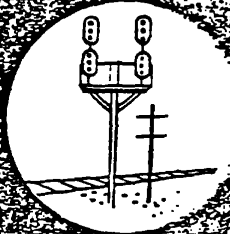
**PRIMARY BATTERY DIVISION
BOONTON, NEW JERSEY**

Le Carbone

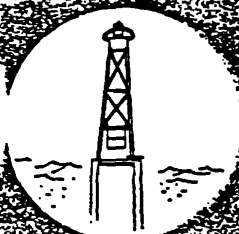
AD-608A

AIR DEPOLARIZED PRIMARY CELL

FOR

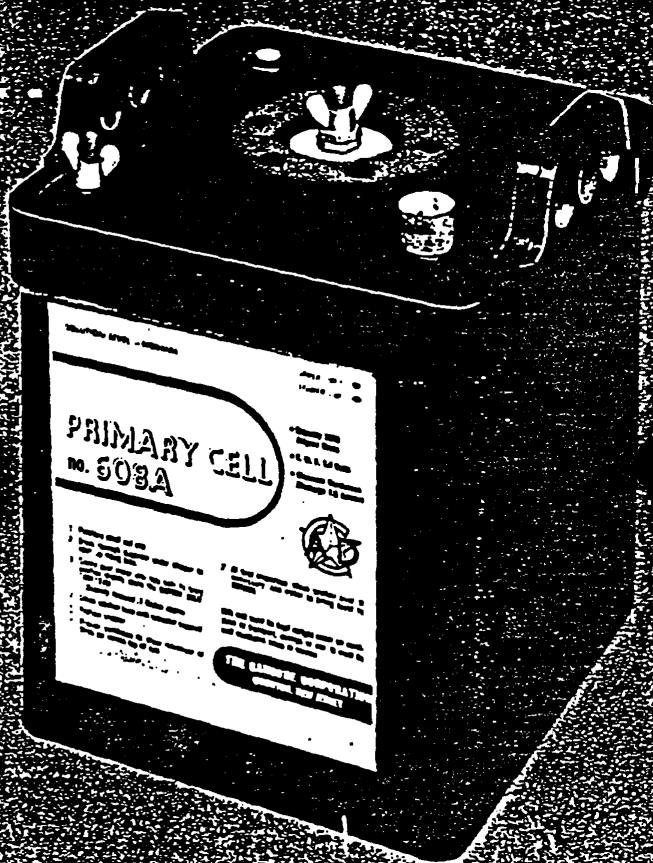


RAILWAY
TRACK CIRCUITS



AIDS TO
NAVIGATION

AND
HEAVY DUTY APPLICATIONS



OUTSTANDING FEATURES

- Small volume and weight for high capacity
- Flat line voltage on discharge
- Minimum labor required for handling, installation and maintenance

- Safe operation at extremely low temperatures
- Completely sealed and inert in storage
- Small quantity of water required for activation

THE CARBONE CORPORATION



BOONTON, NEW JERSEY